COMPLEX MOLECULES IN REGIONS OF STELLAR AND PLANETARY FORMATION

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A large number of organic molecules have been detected in the gas phase of interstellar clouds. Interestingly, the molecules found in very cold portions of clouds (10 K) with little evidence of advanced star formation are exotic by terrestrial standards while the molecules found in warmer regions of star and planet formation (100 – 300 K) tend to be more terrestrial in nature. The synthesis of the exotic molecules is ironically well understood in terms of gas-phase ion-molecule reactions, which tend to produce very unsaturated species, as well as ions, both positively and negatively charged, isomers, and radicals. On the other hand, the formation of more hydrogen-rich terrestrial-type organic molecules in star-forming regions is not well understood. Most investigators feel, however, that reactions on interstellar dust particles followed by sublimation into the gas as temperatures rise play a major role. This binary view now appears to be too simple because some terrestrial-type organic molecules (e.g. dimethyl ether, methyl formate, acetaldehyde) have recently been found in regions thought to be at 10 K. In my talk, I will discuss current models of how complex molecules are formed in several evolutionary stages of star formation including cold cores, so-called hot cores and corinos, and protoplanetary disks, the stage before planetary formation.

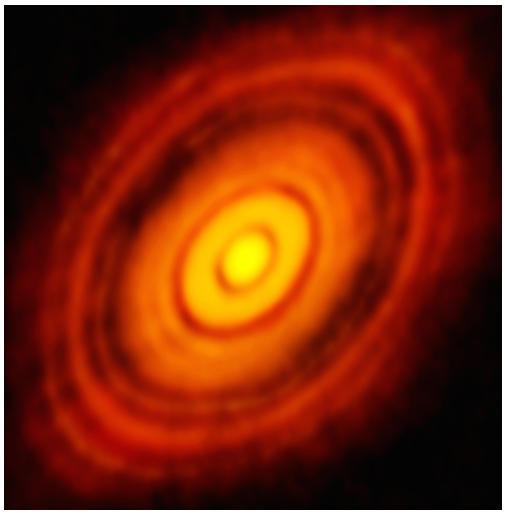

Figure 1 HL Tau, a nearby protoplanetary disk, in which planets are starting to form.